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ian. In fact, it is not infrequently mistaken for black obsidian or volcanic glass, which also occurs in great quantity in this Territory. Uintahite is also very brittle. When heated it melts readily, but will not burn. This substance is hauled in wagons from the mines near Fort Duchesne, in Uintah County, to Pleasant Valley Junction, on the Rio Grand Western Railway, a distance of more than a hundred miles, to be shipped East for the manufacture of varnish.

Wurtzillite bears a remarkably close resemblance to uintahite. It has a similar color, lustre, fracture and specific gravity, and it is about equally brittle. But wurtzillite readily burns, yielding a bright light from the combustion of illuminating gases. Again, its streak is black, and it is slightly sectile, being capable of being cut or pared by a knife much as rubber or horn may be pared. Wurtzillite has been reported from Wasatch County, as well as from Emery and Uintah Counties, in considerable amount. Asphaltum occurs in Emery and San Pete Counties. It is somewhat mixed with sand and other impurities, but it is already being mined in considerable quantity for paving the streets of various Western cities.

In addition to wurtzillite, uintahite, asphaltum and ozocerite, other hydro-carbons are found in Utah; for example—albertite, petroleum and natural gas. But, as yet, none of the latter have been made productive.

HENRY MONTGOMERY.

University of Utah, Salt Lake City, July 29.

ANIMAL VOCABULARIES.

A GOOD deal has been said about the probable existence of definite vocabularies in the language of the lower animals, and I believe one has gone to Africa to study Simian speech. This is all well enough, but there is no need of going beyond the barn yard to hear a definite animal vocabulary of a considerable number of words. Hear the rooster's warning cry when he sees or hears indications of danger. It is a definite sound, and perfectly understood by every hen and chick. Drop food to the mother hen. She quickly inspects it, and if approved, tells the little ones to eat, by uttering her well known "Coot, coot, coot!" If she decides that it is not fit to eat, she as plainly tells them to let alone. The other day a green worm fell from a tree near a brood of chickens. Every chick ran to seize the morsel. The mother gave one quick glance at the insect and said, "*Skr-r-r-p!*" Every chick stopped instantly. But one wilful child, loth to believe his mother's assurance that it wasn't fit to eat, would make him sick, etc., started a second time to pick up the worm. "*Skr-r-r-p!*" commanded the hen sharply. Even the wilful child obeyed this time, and the whole brood walked off contentedly. Discuss as we will the particular reason for the hen's cackle before and after laying, the fact remains that it is a definite utterance, as plainly understood by both gallinæ and homines as any expression in human speech.

My horse has a low whinny which means "water," and a higher-keyed, more emphatic neigh means food. When I hear these sounds I know as definitely what she means as if she spoke in English. This morning, passing along the street, I heard that same low whinny and, looking up, saw a strange horse regarding me with a pleading look. I knew he was suffering from thirst, and no language could make it plainer.

The language of the lower animals is not all articulate. It is largely a sign language. The horse does a deal of talking by motions of the head and by his wonderfully expressive looks. He also, upon occasion, talks with the other extremity. A peculiar switch of the tail and a gesture, as if threatening to kick, are equine forms of speech. The darkey was not far wrong who said of the kicking mule, "It's just his way of talking!"

The dog can not only "look volumes," but can express whole sentences by wags of the tail more readily than can the waving flags of the signal corps. All that is necessary is to learn his code. We expect our domestic animals to learn our language, and punish them cruelly if they fail to both understand and obey our commands; yet, notwithstanding our higher intelligence, we fail to learn their language, by means of which we might better understand their wants and dispositions, and thus control them by kindness and sympathy, instead of by harsh and arbitrary treatment. I see horses passing along the street, which are saying by every look and motion that they are suffering acute torture from a too short check rein. Their drivers are often people who would be shocked if they could comprehend their own cruelty. But they do not understand horse language, and some of them do not seem to have horse sense.

The language of animals is a neglected subject. The facilities for its study are within the reach of all, and no previous preparation is required. The study can be pursued without interfering with other occupations, and even a little systematic observation will bring large returns in both pleasure and profit.

CHARLES B. PALMER.

Columbus, Ohio.

A MAYA MONTH-NAME—KHMERS.

In *Science*, Aug 4, Professor Thomas gives a new name to the 17th month of the Maya calendar on the basis of a phonetic rendering of its symbol.

I do not intend to dispute the correctness of his rendering; I think it quite possible he is right; but I seriously question his inference, that, because the symbol reads *ak-yab*, that therefore was the month-name.

The work *kayab* is from the verbal stem *kay*, to sing or warble. As this concept cannot be objectively represented, the Mayas had recourse to a method very familiar with them, that of the rebus, to convey or keep in memory its approximate sounds. They chose to indicate the guttural initial *k* by a turtle, called in their tongue *ak*; prefixing it to the syllable *yab*.

This method of writing is what I have called "ikonomatic," and I have shown abundant instances of it in Mexico and Central America. (See my "Essays of an Americanist," pp. 213-229). Through neglecting to regard its principles, both Prof. Thomas and Dr. Selser have made several obvious errors in translating the Mexican and Maya codices, as I expect to show in a work I am preparing on the calendar system of those nations.

With regard to the origin of the Khmers and their ethnic affiliation, I do not think that Professor Keane's claim is relevant to that put forward by Dr. Maurel. The latter maintains that the Khmers belong to the "Aryan," in the sense of the "Sanskritic" peoples; and that they are in Cambodia an intrusive stock, arriving practically within historic times. I understand Professor Keane to differ with both these opinions.

D. G. BRINTON.

Media, Aug. 7.

THEORY OF COLOR SENSATION.

An objection to my theory of color-sensation (an abstract of which has lately appeared in *Science*) has been more than once made to me, which needs to be met, but which can be met very easily. It is that I suppose the three primary color-sensations to be conveyed to the brain by one and the same nerve, and hence that the theory is not consistent with the widely accepted doctrine of the specific energy of nerves,—the doctrine, namely, as applied to the eye, that we recognize two reds to be like sensations, not by any specific quality in the sensation, but by the fact that they affect the same set of nerves, and that if a pure blue light could by any possibility be

made to cause these nerves to "vibrate" (to use the original Helmholtzian term) the sensation communicated to consciousness would still be red. But this doctrine, which has strong reasons in its favor, as regards the sense of hearing, had never much support in the sense of smell and taste, and has now been totally disproved for the sense of sight.

A few years ago Holmgren announced a remarkable discovery, and at the same time a remarkable confirmation of the original theory of Helmholtz. He caused a very minute image of a point of light to fall upon the retina, so minute as to be smaller in diameter than the diameter of the rods and cones. If this image was of white light, it felt to the observer sometimes red, sometimes green and sometimes blue, as it moved about the retina; if it was of yellow light, it looked sometimes red and sometimes green; and the primary colors were at times altogether invisible. If this observation had been confirmed by other investigators, it would have proved conclusively that each minutest fibre of the optic nerve responds only to a limited range of vibration-periods of light, and that, as Helmholtz at first was inclined to suppose (he says explicitly in the first edition of his *Physiological Optics* that the three effects *may* all be capable of being transmitted by a single nerve), three adjacent fibres must participate in conveying a sensation of grey to the brain. But this observation of Holmgren has *not* been confirmed. The experiments have been repeated by Hering with quite opposite results, and he has also detected the probable source of Holmgren's error; and Hering's results have been confirmed in Helmholtz's laboratory. Hering's paper on the subject was published in *Pflüger's Archiv* some four years ago; I am unable to look up the exact date, as the admirable free public library of Duluth as yet lacks scientific books of a non-popular character. In view of these experiments, no writer on physiological optics (not even Helmholtz) at present expresses himself in any other language than that which implies that all the physiological processes essential to the production of grey-sensations and of color sensations may go on in a single cone (if not in a single rod).

C. L. FRANKLIN.

Duluth, Aug. 2, 1893.

CURRENT NOTES ON ANTHROPOLOGY.—NO. XXXII.

[Edited by D. G. Brinton, M. D., LL. D., D. Sc.]

RECENTLY PUBLISHED AMERICAN CODICES.

So rare are the documents which escaped the fanatic iconoclasm of the early missionaries, that it is a most agreeable duty to chronicle the discovery and publication of hitherto unknown Codices, or native manuscripts, of the Mexican and Central American peoples.

Last year, the American Philosophical Society published in admirable style the Codex Poinsett, the fragment of a pre-Columbian book relating to the collection of taxes in the ancient empire of Anahuac (a term entirely proper, in spite of Dr. Seler's onslaught upon it). Its name was given to it after Mr. Poinsett, formerly minister of the United States to Mexico, who brought it from that country and presented it to the Society, which has at considerable cost had it carefully chromo-lithographed and incorporated in its Transactions.

With not less praiseworthy zeal the Royal Library of Berlin has within the present year issued fac-similes of sixteen fragments of native Mexican MSS., brought from that country by Alexander von Humboldt, accompanying them with a small volume (pp. 136) of explanatory text from the pen of Dr. Seler, whose knowledge of the subject places him in the very front rank of Mexicanists. A few of these fragments, three or four of them, date anterior to the conquest; but the majority are subsequent to

it, though none probably later than 1571. They are all of value in the study of the hieroglyphic script.

A third Codex of remarkable interest, and unquestionably ancient, has been published at Geneva by M. Henry de Saussure under the title of "*Le Manuscrit du Cacique.*" It contains sixteen pages or plates, in colors, and tolerably well preserved. According to the statements about it, it is not of Nahuatl, but of Mistecan origin, which would increase its value, as this tribe is one of whom we have few monuments, though we know its culture ranked high, and dated from remote antiquity. It is said to contain the biography of a certain powerful Cacique, by name Sar Ho, whence the name given it.

The great libraries of our country should not delay to secure copies of these three ancient documents, as they are all published in limited editions, and they should be placed within reach of those in this country who devote some of their time to the fascinating problem of American hieroglyphic writing.

ETHNOLOGIC JURISPRUDENCE.

The first volume of a work, which will certainly be an epoch-making one, has appeared in Germany. It is Dr. Albert Hermann Post's "*Grundriss der Ethnologischen Jurisprudenz*" (A. Schwartz, Leipzig). It will be followed by a second volume, which will not be long delayed.

The author is already well known as a leading student in this department of ethnology, and also as a profound thinker on the fundamental problems of the social relations of man. In his present work he sets out in the first volume to exhibit all the primitive forms of law, custom and procedure, so that from them the fundamental and universal principles of the jurisprudence of all nations can be deduced. The second volume will indicate the development of these general principles in special fields of human law.

In this first volume, Dr. Post defines the elementary forms of the social organization as all reducible to four, the consanguine, the territorial, the feudal, and the social; or, the tribal, the communal, the regal and the democratic. Each of these has its own peculiar theory of what relates to ethics, rights and laws; and though in minor details there are constant and wide variations, each is controlled in its development by obedience to certain underlying principles, which place its moral and legal codes on diverse paths of development. They are in a measure historically sequent, the consanguine organization always being that of men in the lowest stages of culture, while the true social organization is as yet chiefly ideal, and may never be fully reached in practice.

The style of the author is terse and clear, and his reading is most extensive and accurate. The field he has chosen is a comparatively new one, and the results he has reached are in the highest degree of immediate and practical importance. It has been well said by Dr. Krauss, of Vienna, in a recent publication, that it would be a fortunate chance to substitute some of Dr. Post's reflections on the rights of humanity for the wholesale murder stories which stir the heart of youth in the school readers, under the name of patriotic wars.

THE STUDY OF PREHISTORIC ARCHÆOLOGY.

Now that archæology is recognized to be the only guide where history is silent, and often the more trustworthy guide where history talks a good deal, its systematic study should interest all who occupy themselves with questions of the higher education.

Dr. Hoernes, whose work on that branch has been already mentioned in these columns, contributes to the last number of the *Zeitschrift für Ethnologie* a scheme for the instructor, which is intended to present all the science in the most favorable manner for the student. It is as follows: